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(54) **EYELET FOR ARTICLE OF FOOTWEAR**

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A43C 5/00	(2006.01)
A43C 7/00	(2006.01)
A43C 3/00	(2006.01)

(52) **U.S. Cl.**

CPC ***A43C 5/00*** (2013.01); ***A43C 3/00*** (2013.01); ***A43C 7/00*** (2013.01)

(58) **Field of Classification Search**

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USPC 36/50.1; 24/713.6
See application file for complete search history.

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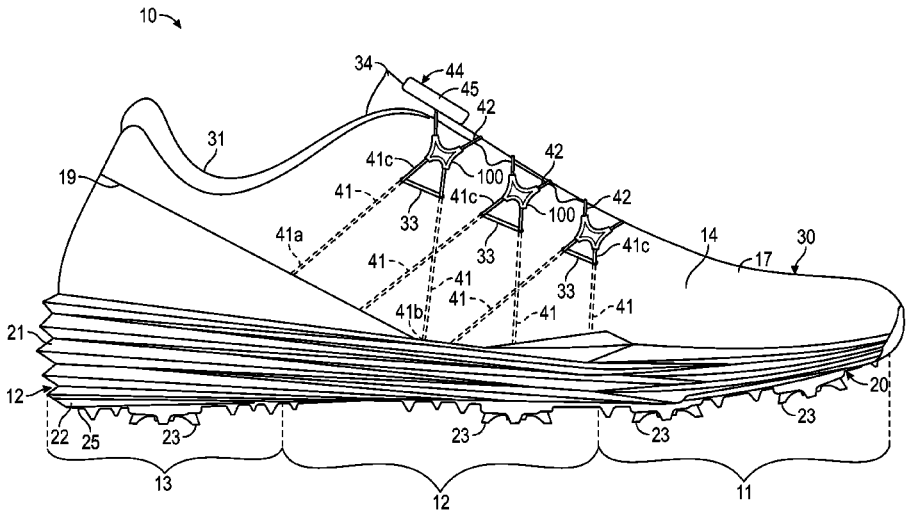
(57) **ABSTRACT**

An eyelet for an article of footwear includes an eyelet body configured to slidably couple a first string to a second string. The eyelet body defines a first arc-shaped aperture and an opposing, second arc-shaped aperture. The first arc-shaped aperture is configured to slidably receive the first string, and the second arc-shaped aperture is configured to slidably receive the second string. The eyelet may be disposed over (but not necessarily attached to) an upper of an article of footwear.

3 Claims, 2 Drawing Sheets



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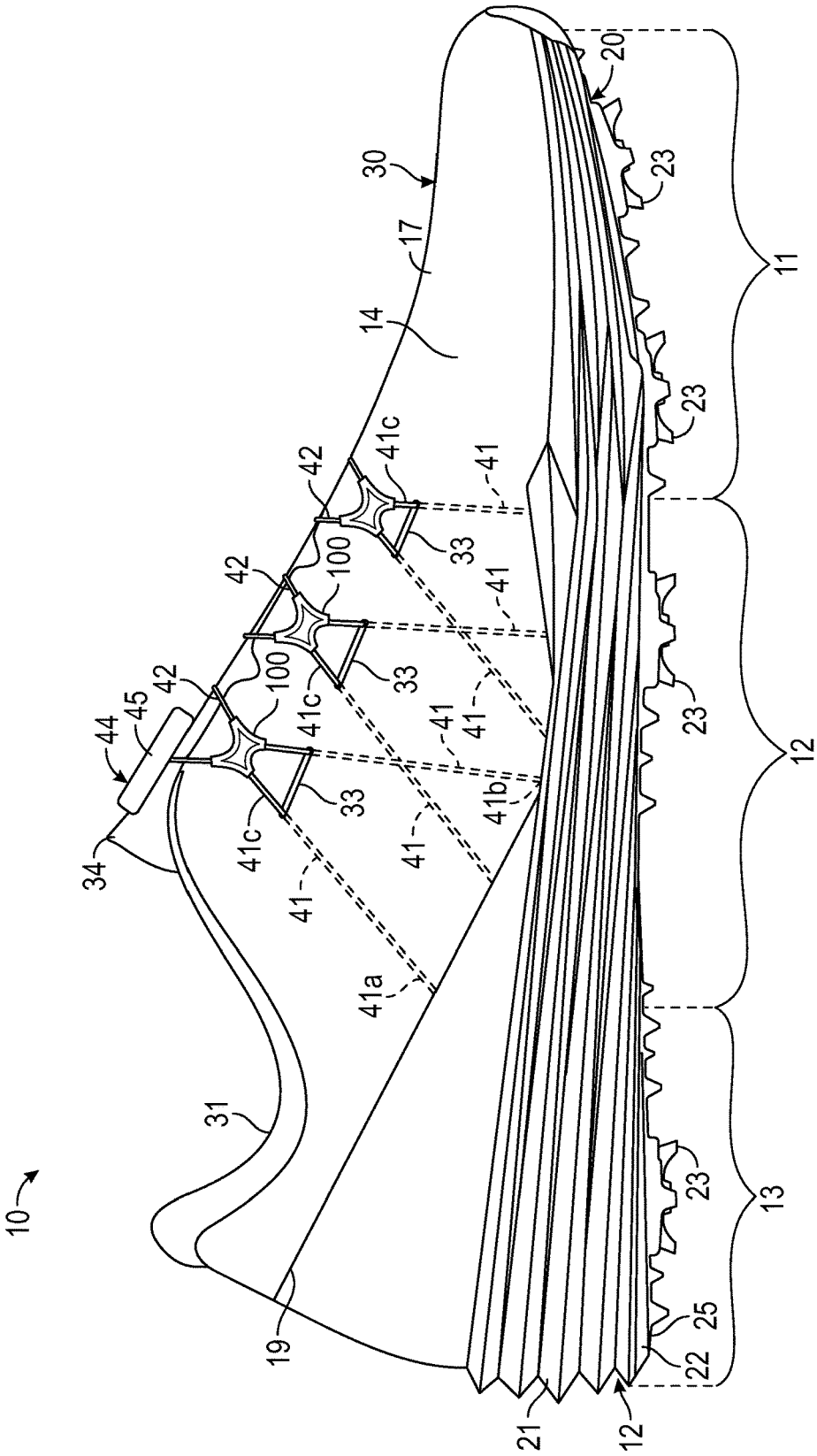
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FIG. 1

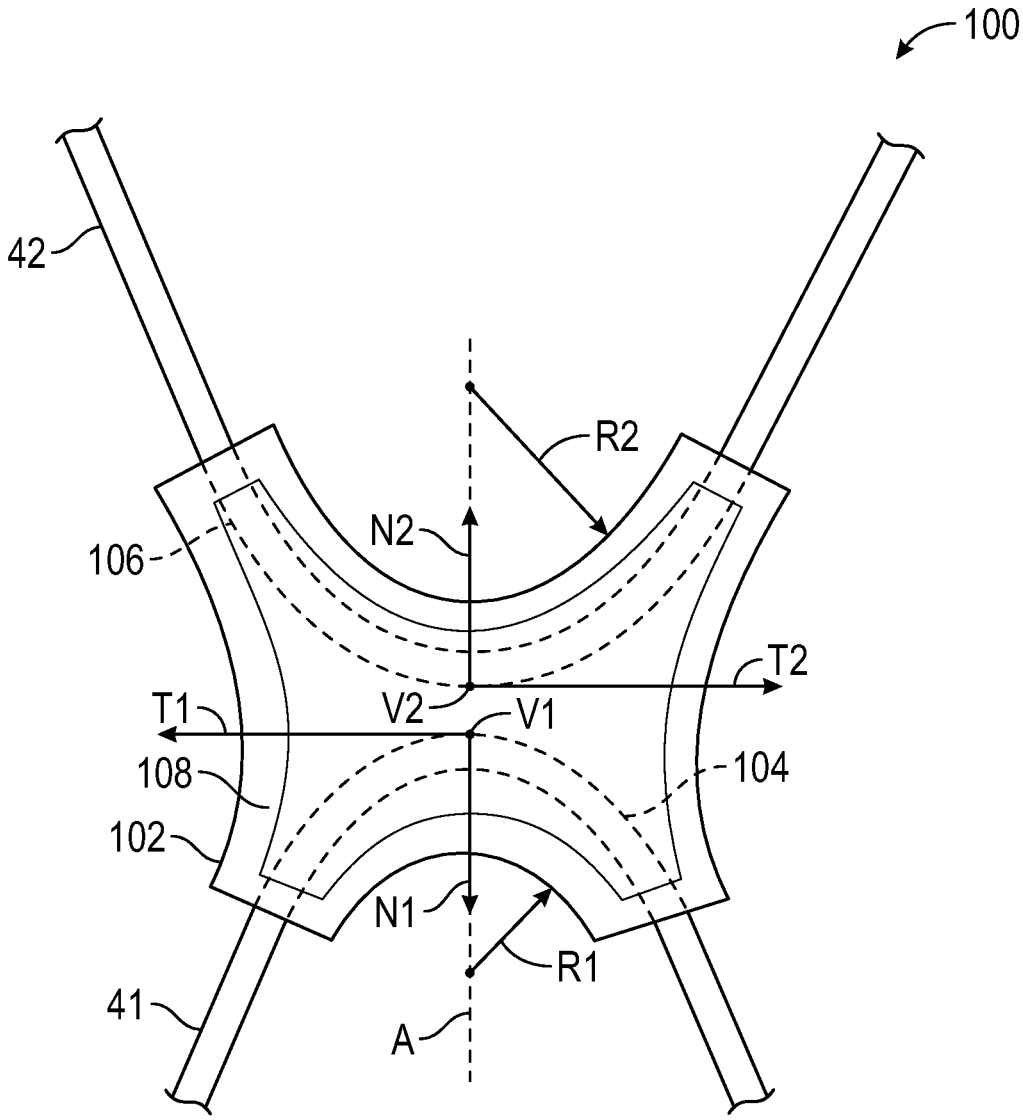

FIG. 2

EYELET FOR ARTICLE OF FOOTWEAR

CROSS-REFERENCE TO RELATED APPLICATIONS

The present application claims priority, and the benefit of, U.S. Provisional Patent Application No. 62/167,661, filed on May 28, 2015, the entire disclosure of which is incorporated by reference herein.

TECHNICAL FIELD

The present disclosure relates to an eyelet for an article of footwear.

BACKGROUND

Footwear typically includes an upper and a sole coupled to the upper. In addition, the footwear may include laces for adjusting the upper to the wearer's foot. The laces may be connected to the upper in order to allow the wearer to tighten the laces.

SUMMARY

The present disclosure relates to an eyelet for an article of footwear. In an embodiment, the eyelet includes an eyelet body configured to slidably couple a first string to a second string. The eyelet body defines a first arc-shaped aperture and an opposing, second arc-shaped aperture. The first arc-shaped aperture is configured to slidably receive the first string, and the second arc-shaped aperture is configured to slidably receive the second string. The eyelet may be disposed over (but not necessarily attached to) an upper of an article of footwear. The article of footwear includes an upper and a sole structure coupled to the upper. During operation, the slidable motion of the second string relative to the eyelet is operative to adjust the position of the upper relative to the sole structure.

The above features and advantages and other features and advantages of the present teachings are readily apparent from the following detailed description of the best modes for carrying out the teachings when taken in connection with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a schematic, side view of an article of footwear including a plurality of eyelets; and

FIG. **2** is a schematic, front view of one of the eyelets shown in FIG. **1**.

DETAILED DESCRIPTION

"A," "an," "the," "at least one," and "one or more" are used interchangeably to indicate that at least one of the item is present; a plurality of such items may be present unless the context clearly indicates otherwise. All numerical values of parameters (e.g., of quantities or conditions) in this specification, including the appended claims, are to be understood as being modified in all instances by the term "about" whether or not "about" actually appears before the numerical value. "About" indicates that the stated numerical value allows some slight imprecision (with some approach to exactness in the value; approximately or reasonably close to the value; nearly). If the imprecision provided by "about" is not otherwise understood in the art with this ordinary meaning, then "about" as used herein indicates at least variations that may arise from ordinary methods of measuring and using such parameters. In addition, a disclosure of a range is to be understood as specifically disclosing all values and further divided ranges within the range.

The terms "comprising," "including," and "having" are inclusive and therefore specify the presence of stated features, steps, operations, elements, or components, but do not preclude the presence or addition of one or more other features, steps, operations, elements, or components. Orders of steps, processes, and operations may be altered when possible, and additional or alternative steps may be employed. As used in this specification, the term "or" includes any one and all combinations of the associated listed items.

Those having ordinary skill in the art will recognize that terms such as "above," "below," "upward," "downward," "top," "bottom," etc., are used descriptively for the figures, and do not represent limitations on the scope of the present teachings, as defined by the claims.

Referring to the drawings, wherein like reference numbers refer to like components throughout the views, FIG. **1** schematically illustrates an article of footwear **10** including a sole structure **20** and an upper **30** coupled to the sole structure **20**. For reference purposes, article of footwear **10** may be a golf shoe and may be divided into three general regions: a forefoot region **11**, a midfoot region **12**, and a heel region **13**. The footwear **10** also includes a lateral side **14** and a medial side opposite to the lateral side **14**. The forefoot region **11** generally includes portions of the article of footwear **10** corresponding with the toes and the joints connecting the metatarsals with the phalanges. The midfoot region **12** generally includes portions of the article of footwear **10** corresponding with the arc area of the foot, and the heel region **13** corresponds with rear portions of the foot, including the calcaneus bone. The lateral side **14** and medial side (not shown) extend through each of forefoot region **11**, the midfoot region **12**, and the heel region **13** and correspond with opposite sides of the article of footwear **10**. The forefoot region **11**, the midfoot region **12**, the heel region **13**, the lateral side **14** and the medial side are not intended to demarcate precise areas of footwear **10**. Rather, the forefoot region **11**, the midfoot region **12**, the heel region **13**, the lateral side **14** and the medial side are intended to represent general areas of footwear **10** to aid in the following discussion. In addition to the article of footwear **10**, forefoot region **11**, the midfoot region **12**, the heel region **13**, the lateral side **14** and the medial side may also be applied to sole structure **20**, upper **30**, and individual elements thereof.

The sole structure **20** is secured to the upper **30** and extends between the foot and the ground when the article of footwear **10** is worn. The primary elements of sole structure **20** are a midsole **21**, an outsole **22**, and a sockliner (not shown). The midsole **21** is secured to a lower surface of upper **30** and may be formed from a compressible polymer foam element (e.g., a polyurethane or ethylvinylacetate foam) that attenuates ground reaction forces (i.e., provides cushioning) when compressed between the foot and the ground during walking, running, or other ambulatory activities. In further configurations, the midsole **21** may incorporate fluid-filled chambers, plates, moderators, or other elements that further attenuate forces, enhance stability, or influence the motions of the foot, or the midsole **21** may be primarily formed from a fluid-filled chamber. The outsole **22** is secured to a lower surface of the midsole **21** and may be formed from a wear-resistant rubber material that is textured to impart traction. The sockliner is located within the upper

30 and is positioned to extend under a lower surface of the foot. Although this configuration for sole structure **20** provides an example of a sole structure that may be used in connection with the upper **30**, a variety of other conventional or nonconventional configurations for the sole structure **20** may also be utilized. Accordingly, the structure and features of the sole structure **20** or any sole structure utilized with the upper **30** may vary considerably.

The sole structure **20** further includes traction elements **23** disposed along the outsole **22**. Although the drawings show a specific number of traction elements **23** at specific locations in the outsole **22**, it is contemplated that the sole structure **20** may include more or fewer traction elements **23** at different locations relative to the outsole **22**. In the depicted embodiment, the traction elements **23** can be removably mounted to the outsole **22**. At least a portion of each traction element **23** extends beyond the outer outsole surface **25**.

The various portions of the upper **30** may be formed from one or more of a plurality of material elements (e.g., textiles, polymer sheets, foam layers, leather, synthetic leather) that are stitched or bonded together to form a void within the article of footwear **10** for receiving and securing a foot relative to the sole structure **20**. The void is shaped to accommodate the foot and extends along the lateral side of the foot, along the medial side of the foot, over the foot, around the heel, and under the foot. Access to the void is provided by an ankle opening **31** at least partly located in the heel region **13**. The upper **30** further includes a cover layer **17** and a tongue **34** movably coupled to the cover layer **17**. The tongue **34** extends over the interior void of the upper **30** in order to enhance the comfort of the article of footwear **10**.

The article of footwear **10** further includes one or more first strings **41** disposed on one or both of lateral side **14** and medial side. In the present disclosure, the term "string" means a flexible, elongated structure capable of withstanding a tensile load. As non-limiting examples, the term "string" includes, but is not limited to, a cable, a lace, a strand, a wire, a cord, among others. The first strings **41** extend downward from the various string openings **33**. The string openings **33** may be configured as slots or slits and are located closer to the tongue **34** than to the sole structure **20**. In the depicted embodiment, the first strings **41** extend from a lace region of the upper **30** (i.e., the region where string openings **33** or other lace-receiving elements are located) to a lower region of the upper **30** (i.e., the region where sole structure **20** joins with the upper **30**). The first strings **41** may be coupled (e.g., directly attached) to the sole structure **20**, the heel cup **19**, or both. Specifically, each of the first strings **41** includes a first string end **41***a* and a second string end **41***b*, and the first and second string ends **41***a*, **41***b* are coupled to the sole structure **20**, the heel cup **19**, or both. For instance, the first and second string ends **41***a*, **41***b* may be directly bonded to the sockliner of the sole structure **20**. The number of first strings **41** may vary and, in the depicted embodiment, the first strings **41** are oriented in a rearwardly-angled direction in the area between the string openings **33** and the sole structure **20**. However, it is contemplated that the first strings **41** may be oriented vertically relative to the sole structure **20**. Regardless of its orientation, the first strings **41** may be partially embedded inside the upper **30**. For instance, the first strings **41** may be disposed between an inner layer (not shown) and the cover layer **17** of the upper. Each of the first strings **41** includes an intermediate string portion **41***c* disposed between the first string end **41***a* and the second string end **41***b*. The intermediate string portion **41***c* extends through the string opening **33** and is therefore disposed outside the upper **30**. Each intermediate string portion **41***c* is slidably coupled to an eyelet **100**.

During activities that involve walking, running, or other ambulatory movements (e.g., cutting, braking), a foot within the void in the article of footwear **10** may tend to stretch the upper **30**. That is, many of the material elements forming the upper **30** may stretch when placed in tension by movements of the foot. Although the first strings **41** may also stretch, the first strings **41** generally stretch to a lesser degree than the other material elements forming the upper **30**. Each of the first strings **41** and the second strings **42** may be located, therefore, to form structural components in the upper **30** that (a) resist stretching in specific directions or locations, (b) limit excess movement of the foot relative to the sole structure **20** and the upper **30**, (c) ensure that the foot remains properly positioned relative to the sole structure **20** and the upper **30**, and (d) reinforce locations where forces are concentrated. As non-limiting examples, suitable materials for the first strings **41** include various filaments, fibers, yarns, threads, cables, or ropes that are formed from rayon, polyamide, polyester, polyacrylic, silk, cotton, carbon, glass, aramids (e.g., para-aramid fibers and meta-aramid fibers), ultra-high molecular weight polyethylene, liquid crystal polymer, copper, aluminum, or steel.

The article of footwear **10** further includes one or more second strings **42** (.e.g., laces) extending through various eyelets **100** and along part of the lateral side **14** and the medial side of the upper **30**. For example, the second strings **42** may extend over the tongue **34** of the upper **30** and part of the cover layer **17**. As such, the second string **42** can be cinched to permit the wearer to modify dimensions of the upper **30** to accommodate the proportions of the foot. More particularly, the second string **42** permits the wearer to tighten the upper **30** around the foot and to loosen the upper **30** to facilitate entry and removal of the foot from the void (i.e., through ankle opening **31**). As non-limiting examples, the second strings **42** may be a cable, a lace, a strand, a wire, cord, among others. In the depicted embodiment, the second string **42** is a cable, and the first string **41** is a wire. The second string **42** may be operatively coupled to a reel based closure system **44** configured to tighten or loosen the first string **41** and the second string **42**. As non-limiting examples, the article of footwear **10** may include a reel based closure system as described in U.S. Patent Publication Nos. 2015/0033519 and 2014/0290016, which are hereby incorporated by reference in their entirety. The reel based closure system **44** includes a rotatable knob **45**. During operation, a user can turn the rotatable knob **45** in order to reel the second string **42**, thereby tightening or loosening the first string **41** and the second string **42**. Because the first strings **41** are attached to the bottom of the article of footwear **10** (e.g., the sole structure **20**), the first strings **41** and the second strings **42** provide the user with more freedom to tighten or loosen the article of footwear **10** in comparison to conventional articles of footwear. To this end, the article of footwear **10** includes at least one eyelet **100** slidably coupling at least one of the first strings **41** to at least one of the second strings **42**. The eyelets **100** therefore allow the user to adjust (e.g., tightening or loosening) the first strings **41** and/or the second strings **42** while minimizing friction between the first strings **41** and the second strings **42**. Although the depicted embodiment shows the reel based closure system **44** operatively coupled to the second strings **42**, it is envisioned that the reel based closure system **44** may be operatively coupled to the first strings **41**, the second strings **42**, or both. Alternatively, the article of footwear **10** may include one reel based closure system **44** operatively

coupled to the first strings **41**, and another reel based closure system operatively coupled to the second strings **42**. The reel based closure systems **44** may be coupled to any suitable part of the upper **30**, such as the tongue **34** or the cover layer **17** along the lateral side **14** or the medial side. In an alternate embodiment, neither the first strings **41** nor the second strings **42** are operatively coupled to the reel based closure system **44**. In such case, the article of footwear **10** may not include the reel based closure system **44**.

The eyelets **100** are freely disposed over (but not attached to) the upper **30** in order to allow dynamic adjustment of the first string **41** and the second string **42**. In other words, the eyelets **100** are free-floating relative to the upper **30** and are only directly coupled to the first string **41** and the second string **42**. Therefore, the eyelets **100** are not necessarily directly attached to the cover layer **17** (or any other of the upper **30**). Moreover, the eyelets **100** are closer to the tongue **34** than to the sole structure **20**. Furthermore, each eyelet **100** slidably couples the second string **42** to at least one of the first string **41**. As such, the first string **41** and the second string **42** can both slide through one eyelet **100**, thereby facilitating tightening or loosening the second string **42**. Although the drawings show one eyelet **100** slidably coupling the first string **41** to the second string **42**, it is contemplated that the eyelet **100** may slidably couple two portions of the same string.

With reference to FIGS. **1** and **2**, each eyelet **100** includes an eyelet body **102** made of a substantially rigid material, such as a rigid polymeric material (e.g. polyamide) or a rigid metallic material, in order to withstand the tensile loads exerted by moving the first string **41** and the second string **42** on the eyelet **100**. The eyelet body **102** is configured to slidably couple the first string **41** to the second string **42** and serves as a guide in order to direct the movement of the first string **41** and the second string **42** when the user tightens or loosens the second string **42** to the upper **30**. To this end, the eyelet **100** defines a first arc-shaped aperture **104** configured, shaped, and sized to slidably receive the first string **41** and a second arc-shaped aperture **106** configured, shaped, and size to slidably receive the second string **42**. A solid, rigid support **108** is disposed between the first arc-shaped aperture **104** and the second arc-shaped aperture **106** in order to prevent direct contact between the portions of the first string **41** and the second string **42** disposed inside the eyelet **100**. Each of the first arc-shaped aperture **104** and a second arc-shaped aperture **106** extends through the eyelet body **102** and may be mirror images of each other.

The first arc-shaped aperture **104** has a first vertex V**1**, and the second arc-shaped aperture **106** has a second vertex V**2**. In the present disclosure, the term "vertex" means a point where the first derivative of a curvature is zero. In the depicted embodiment, the first vertex V**1** is the maximum of the curvature defined by the first arc-shaped aperture **104**, and the second vertex V**2** is the minimum of the curvature defined by the second arc-shaped aperture **106**. The first vertex V**1** and the second vertex V**2** may be aligned along a linear axis A in order to balance the tensile loads applied to the eyelet **100** by the first string **41** and the second string **42**. Accordingly, the linear axis A intersects the first vertex V**1** and the second vertex V**2**. The first arc-shaped aperture **104** has a first tangent vector T**1** and a first normal unit vector N**1** at the first vertex V**1**, and the second arc-shaped aperture **106** has a second tangent vector T**2** and a second normal unit vector N**2** at the second vertex V**2**. In the present disclosure, the term "tangent vector" means a vector that is tangent to a curve at a given point. The first tangent vector T**1** is tangent to the first-arc shaped aperture **104** at the first vertex V**1**, and the second tangent vector T**2** is tangent to the second arc-shaped aperture **106** at the second vertex V**2**. The term "normal unit vector" means a vector that is perpendicular to a tangent vector. The first normal unit vector N**1** is perpendicular to the first tangent vector T**1**, and the second normal unit vector N**1** is perpendicular to the second tangent vector T. The "normal unit vector" and the "tangent vector" are described by the Frenet-Serret formulas. In the present disclosure, the first arc-shaped aperture **104** and the second arc-shaped aperture **106** are mirror images of each other and, as such, the first normal unit vector N**1** is opposite to (or otherwise different from) the second normal unit vector N**2** in order to allow the first string **41** and the second string **42** to be adjustable independently of each other. In other words, the first arc-shaped aperture **104** and the second arc-shaped aperture **106** are in an opposed relationship to each other.

The first arc-shaped aperture **104** has a radius of curvature R**1**, and the second arc-shaped aperture has a second radius of curvature R**2**. The second radius of curvature R**1** may be larger than the second radius of curvature R**2**, or vice-versa, in order to facilitate adjustment of the second string **42** by the reel based closure system **44**. It is nevertheless contemplated that the first radius of curvature R**1** may be equal to the second radius of curvature R**2**. Furthermore, the second radius of curvature R**2** of the eyelet **100** closest to the reel based closure system **44** is larger than the second radius of curvature R**2** of the eyelet **100** that is farthest from the reel based closure system **44**. Moreover, the second radius of curvature R**2** of the eyelets **100** may incrementally decrease as the eyelets **100** are positioned farther from the reel based closure system **44**. Another reel based closure system **44** can also be operatively coupled to the first strings **41**. Alternatively, the article of footwear **10** may not include the reel based closure system **44**.

Because of the curvature of the first arc-shaped aperture **104** and the second arc-shaped aperture **106**, the first strings **41** and the second strings **42** define opposing inflection points (i.e., vertices) inside the eyelets **100** to allow adjustment (e.g., tightening or loosening) of the first string **41** and/or the second strings **42** while minimizing friction. During the adjustment of the first strings **41** and/or the second strings **42**, the eyelets **100** are free to move relative to the upper **30** in order to provide the user with more freedom to tighten or loosen the article of footwear **10** in comparison with conventional articles of footwear. The slidable motion of the second string **42** relative to the eyelet **100** is operative to adjust a position of the upper **30** relative to the sole structure.

The detailed description and the drawings or figures are supportive and descriptive of the disclosure, but the scope of the disclosure is defined solely by the claims. While some of the best modes and other embodiments for carrying out the claimed disclosure have been described in detail, various alternative designs and embodiments exist for practicing the disclosure defined in the appended claims. For example, although the disclosed article of footwear is configured as a golf shoe, the described concepts associated with the article of footwear, including the upper, may also be applied to a variety of other athletic footwear types, including baseball shoes, basketball shoes, cross-training shoes, cycling shoes, football shoes, tennis shoes, soccer shoes, and hiking boots, among others. The concepts may also be applied to footwear types that are generally considered to be non-athletic, including dress shoes, loafers, sandals, and work boots. The concepts disclosed herein apply, therefore, to a wide variety of footwear types. Furthermore, the embodiments shown in the drawings or the characteristics of various embodiments

mentioned in the present description are not necessarily to be understood as embodiments independent of each other. Rather, it is possible that each of the characteristics described in one of the examples of an embodiment can be combined with one or a plurality of other desired characteristics from other embodiments, resulting in other embodiments not described in words or by reference to the drawings. Accordingly, such other embodiments fall within the framework of the scope of the appended claims.

The invention claimed is:

1. An eyelet assembly for an article of footwear, the article of footwear including an upper and a sole structure coupled to the upper, wherein the eyelet assembly comprises:

a first string;

a second string; and

an eyelet body configured to slidably couple the first string to the second string, wherein the eyelet body defines a first arc-shaped aperture and an opposing, second arc-shaped aperture, the first arc-shaped aperture is configured to slidably receive the first string, and the second arc-shaped aperture is configured to slidably receive the second string; and wherein a slidable motion of the second string relative to the eyelet is operative to adjust a position of the upper relative to the sole structure; and

wherein the first arc-shaped aperture has a first normal unit vector at a first vertex, the second arc-shaped aperture has a second normal unit vector at a second vertex, the first normal vector has a first vector direction, the second normal vector has a second vector direction, and the first vector direction is opposite to the second vector direction; and

wherein the first arc-shaped aperture has a first tangent vector at the first vertex, the second arc-shaped aperture has a second tangent vector at the second vertex, and the first tangent vector is parallel to the second tangent vector; and

wherein the first normal unit vector the and second normal unit vector are aligned to each other along a linear axis such that the linear axis intersects the first normal unit vector and the second normal unit vector.

2. The eyelet assembly of claim **1**, wherein the first arc-shaped aperture has a first radius of curvature, the second arc-shaped aperture has a second radius of curvature, the first radius of curvature is different from the second radius of curvature.

3. The eyelet assembly of claim **2**, wherein the second radius of curvature is greater than the first radius of curvature.

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